

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A conveyor transfer apparatus comprising:

a first conveyor adapted to transport a plurality of stacks of flat product, the first conveyor having a plurality of spaced-apart, endless-loop belts defining a plurality of gaps therebetween;

an elevator assembly including a plurality of elongate members, each elongate member having a horizontal portion positionable in one of the plurality of gaps defined by the first conveyor, wherein the horizontal portions of the plurality of elongate members cooperatively defines a lift platform, and a vertical actuator that is operable to move the lift platform from a down position, wherein the lift platform is disposed near the first conveyor, and an up position, wherein the lift platform is disposed above the first conveyor, whereby the elevator assembly is adapted to lift at least one of the stacks of flat product from the first conveyor;

a second conveyor disposed at an elevation above the first conveyor and oriented transversely to the first conveyor, the second conveyor having an edge that is disposed near the lift platform when the lift platform is in the up position; and

a pusher assembly having a pusher plate and a horizontal actuator that moves the pusher plate along a horizontal path;

wherein the pusher assembly is positionable near the lift platform when the lift platform is in the up position, and further wherein the pusher plate adapted to push the at least one stack of flat product lifted by the lift platform from the lift platform onto the second conveyor.

2. The apparatus of Claim 1, wherein the conveyor transfer apparatus comprises a plurality of elevator assemblies and a plurality of pusher assemblies.

3. The apparatus of Claim 2, wherein the pusher assemblies further comprise at least one guide rod that is attached to the pusher plate.

4. The apparatus of Claim 2, wherein the pusher plate includes a lower edge having a plurality of indents that are spaced to accommodate the horizontal portions of

the plurality of elongate members such that a portion of the pusher plate extends below a topmost portion of the lift platform.

5. The apparatus of Claim 2, wherein when the horizontal actuator is in the extended position, the associated pusher plate is disposed directly over the second conveyor.

6. The apparatus of Claim 2, wherein each elongate member is formed from a cylindrical rod.

7. The apparatus of Claim 2, wherein the elongate members further comprise an angled-back portion, and wherein the angled-back portion extends between one of the plurality of gaps in the first conveyor when the lift platform is in the up position.

8. The apparatus of Claim 7, wherein the elevator assemblies further comprise a plurality of upright members and a cross member interconnecting the plurality of upright members, the upright members and cross member attaching the elongate members to the vertical actuator.

9. The apparatus of Claim 2, wherein in the vertical actuator includes an electric servomotor.

10. The apparatus of Claim 2, further comprising a plurality of stack detectors that detect the stacks on the first conveyor.

11. The apparatus of Claim 10, wherein the detectors are optical detectors.

12. A conveyor transfer apparatus comprising:  
a first conveyor having a proximal end for receiving a plurality of stacks and a distal end, the first conveyor including a plurality of parallel, spaced-apart, endless-loop belts;

a second conveyor disposed near the distal end of the first conveyor, and elevated with respect to the first conveyor;

a plurality of elevator assemblies, each elevator assembly including a vertical actuator and a plurality of vertical members that are drivably connected to the vertical

actuator such that the vertical actuator selectively moves the vertical members between an up position and a down position, the vertical members defining a lift platform, and wherein the vertical members extend between adjacent endless loop belts of the first conveyor; and

a plurality of pusher assemblies, each pusher assembly associated with one of the plurality of elevator assemblies, the pusher assemblies including a pusher plate and a horizontal actuator that is positioned to selectively move the pusher plate along the associated elevator assembly between a retracted position and an extended position;

wherein the elevator assemblies are operable to lift one of the plurality of stacks from the first conveyor, and the pusher assembly is operable to push the lifted stack from the elevator assembly to the second conveyor.

13. The apparatus of Claim 12, wherein the pusher assemblies further comprise at least one guide rod that is attached to the pusher plate.

14. The apparatus of Claim 12, wherein the pusher plate includes a lower edge having a plurality of indents spaced to accommodate a distal end of the associated elevator assembly such that a portion of the pusher plate extends below the lift platform.

15. The apparatus of Claim 12, wherein when the pusher plate is in the extended position, it is disposed directly over the second conveyor.

16. The apparatus of Claim 12, wherein in the vertical actuator includes an electric servomotor.

17. The apparatus of Claim 12, further comprising a plurality of stack detectors.

18. The apparatus of Claim 17, wherein the stack detectors are optical detectors.

19. A method for automatically arranging stacks of product in multiple rows onto a conveyor in a single row, comprising:

transporting the multiple rows of stacks on a first conveyor, wherein the first conveyor includes a plurality of spaced-apart belts defining gaps therebetween;

lifting the stacks individually from the first conveyor with an elevator assembly having a plurality of vertical members that defines a lift platform, the vertical members being sized and spaced to move vertically in the gaps between the first conveyor belts to engage the stacks; and

pushing the lifted stacks off of the lift platform with a pusher assembly onto a second conveyor that is located near the lift platform, wherein the second conveyor is oriented transversely to the first conveyor.

20. The method of Claim 19, wherein a plurality of elevator assemblies is disposed side by side, the elevators adapted to lift stacks in a particular row.

21. The method of Claim 20, further comprising the step of detecting when a stack of flat product is in position to be lifted by an elevator assembly.

22. The method of Claim 21, wherein the stack is detected with an optical detector.

23. The method of Claim 22, wherein the elevator assembly utilizes a vertical actuator and the pusher assembly utilizes a horizontal actuator.

24. The method of Claim 22, wherein the pusher assemblies push the lifted stacks such that the stacks on the second conveyor are approximately evenly spaced.